

CLAIMS

1. A non-aqueous electrolytic solution for a lithium secondary battery comprising an electrolyte salt in a non-aqueous solvent, wherein the non-aqueous solvent comprises two or more cyclic carbonate compounds, and wherein the non-aqueous electrolytic solution further contains 1 to 10 wt.% of a cyclohexylbenzene compound having a halogenated benzene ring and 0.1 to 5 wt.% of a fluorobenzene compound.
2. The non-aqueous electrolytic solution of claim 1, wherein the two or more cyclic carbonate compounds comprise a compound selected from the group consisting of ethylene carbonate, propylene carbonate and butylene carbonate, and a compound selected from the group consisting of vinylene carbonate, dimethylvinylene carbonate, vinylethylene carbonate and fluoroethylene carbonate.
3. The non-aqueous electrolytic solution of claim 1, wherein the non-aqueous solvent further comprises a linear carbonate compound.
4. The non-aqueous electrolytic solution of claim 3, wherein a volume ratio of the cyclic carbonate compounds and the linear carbonate compound is in the range of 20:80 to 40:60
5. The non-aqueous electrolytic solution of claim 3, wherein the linear carbonate compound comprises methyl ethyl carbonate.

6. The non-aqueous electrolytic solution of claim 1, wherein the cyclohexylbenzene compound having a halogenated benzene ring is 1-fluoro-2-cyclohexylbenzene, 1-fluoro-3-cyclohexylbenzene, 1-fluoro-4-cyclohexylbenzene, 1-chloro-4-cyclohexylbenzene, 1-bromo-4-cyclohexylbenzene, 1-iodo-4-cyclohexylbenzene, 1,2-dichloro-3-cyclohexylbenzene, 1,3-dibromo-4-cyclohexylbenzene, 1,4-dichloro-2-cyclohexylbenzene, 1,2-difluoro-4-cyclohexylbenzene, or 1,3-difluoro-5-cyclohexylbenzene.

7. The non-aqueous electrolytic solution of claim 1, wherein the fluorobenzene compound is fluorobenzene, difluorobenzene, trifluorobenzene, 2,4-difluoroanisole, 2,5-difluoroanisole, or 2,6-difluoroanisole.

8. A lithium secondary battery comprising a positive electrode, a negative electrode and a non-aqueous electrolytic solution comprising an electrolyte salt in a non-aqueous solvent, wherein the non-aqueous solvent comprises two or more cyclic carbonate compounds, and wherein the non-aqueous electrolytic solution further contains 1 to 10 wt.% of a cyclohexylbenzene compound having a halogenated benzene ring and 0.1 to 5 wt.% of a fluorobenzene compound.

9. The lithium secondary battery of claim 8, wherein the two or more cyclic carbonate compounds comprise a compound selected from the group consisting of ethylene carbonate, propylene carbonate and butylene carbonate, and a compound selected from the group consisting of vinylene carbonate, dimethylvinylene carbonate, vinyl ethylene carbonate and fluoroethylene carbonate.

10. The lithium secondary battery of claim 8, wherein the non-aqueous solvent further comprises a linear carbonate compound.

5 11. A process of working a lithium secondary battery comprising a positive electrode, a negative electrode and a non-aqueous electrolytic solution comprising an electrolyte salt in a non-aqueous solvent at a maximum
10 working voltage of higher than 4.2 V, wherein the non-aqueous solvent comprises two or more cyclic carbonate compounds, and wherein the non-aqueous electrolytic solution further contains 1 to 10 wt.% of a cyclohexylbenzene compound having a halogenated benzene ring and 0.1 to 5 wt.% of a fluorobenzene compound.